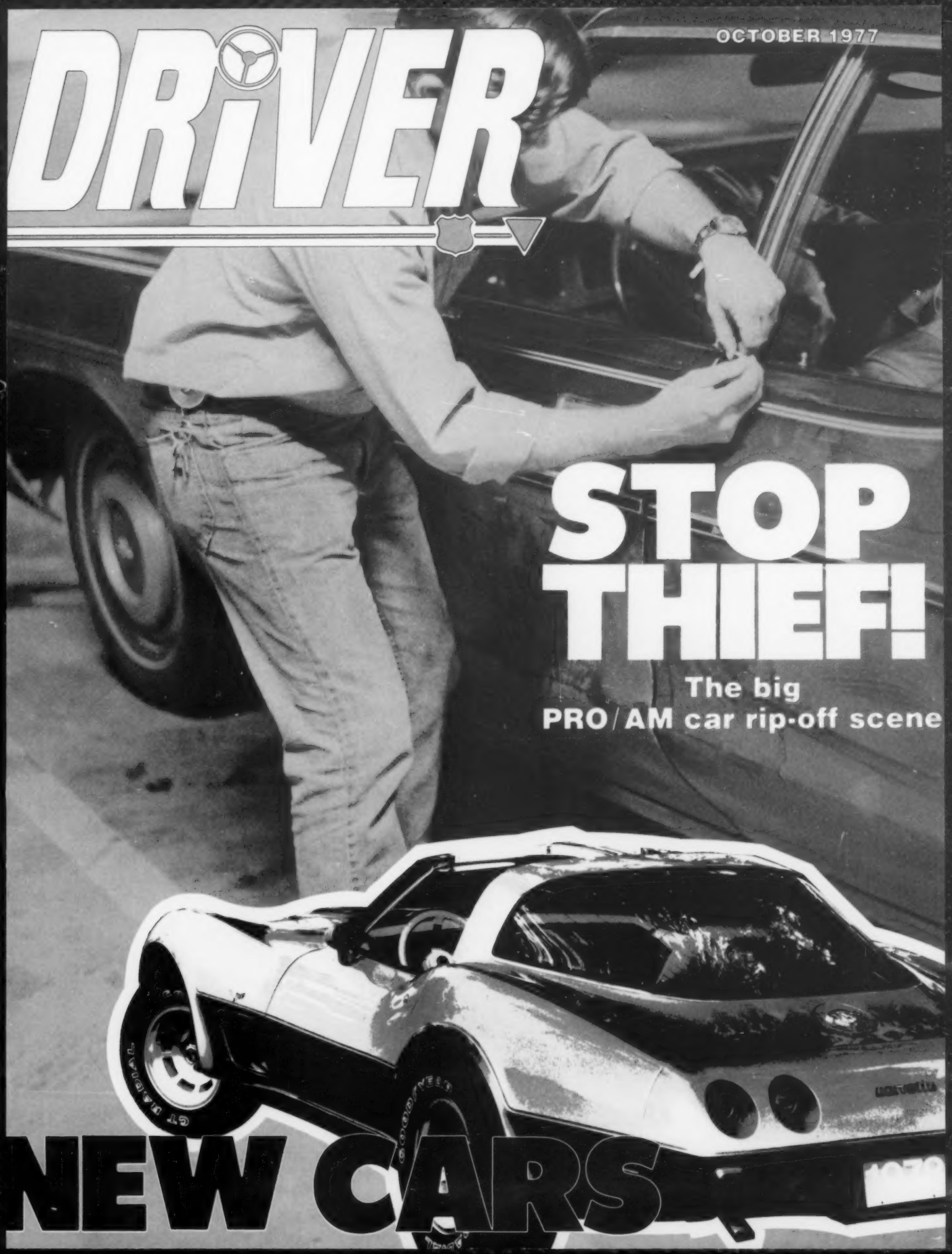
DRIVER

OCTOBER 1977



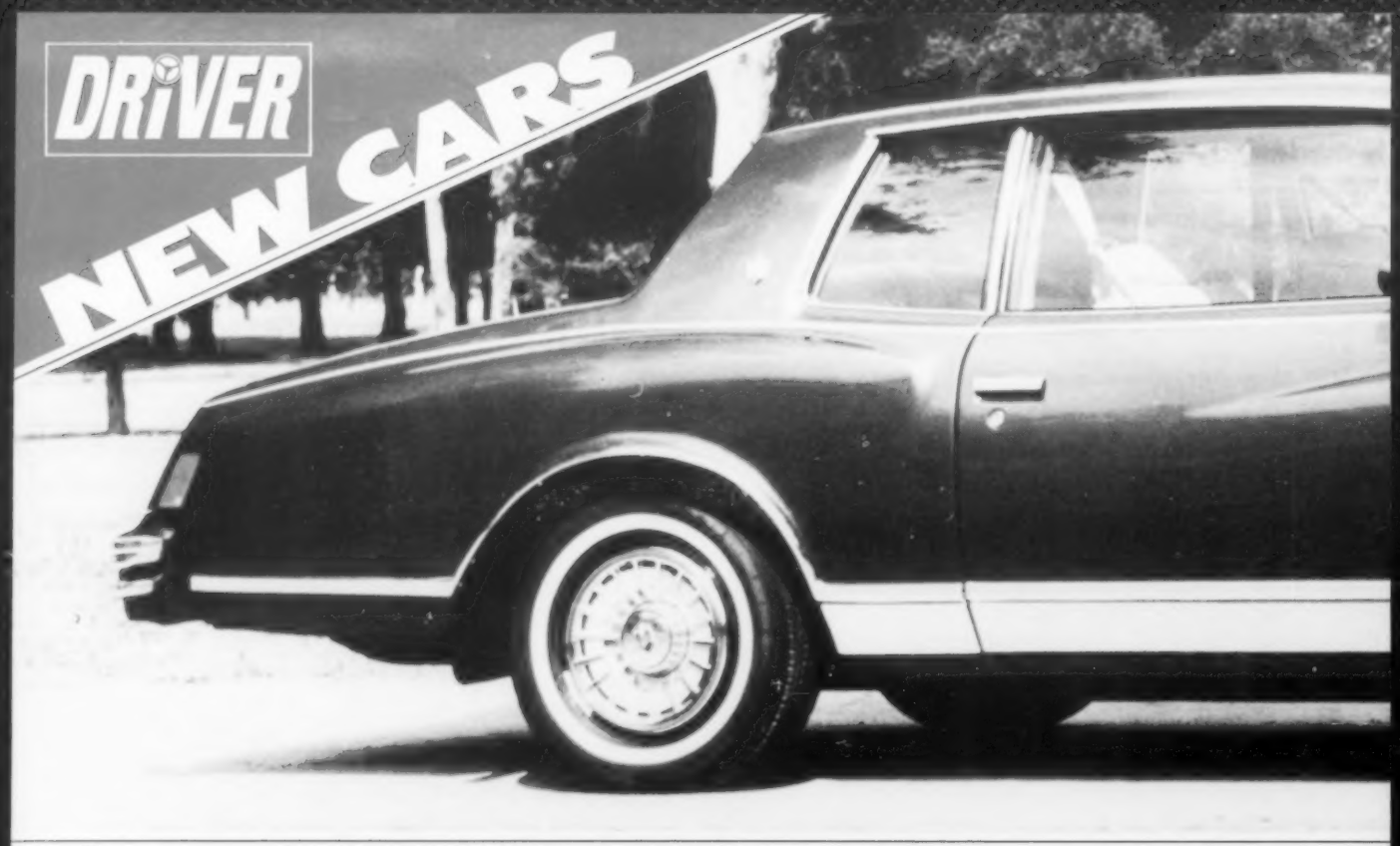
STOP THIEF!

The big PRO/AM car rip-off scene

NEW CARS

DRiVER

NEW CARS



SAFETY and the seventy

AMX Hatchback from AMC has spoilers, flares, wide tires and hood decals to appeal to the sporting buyer. Model standing by car is neither optional nor standard . . . you have to provide your own.

78

Showing new sculptured lines in a roomier but shorter body, Monte Carlo for '78 is 817 pounds lighter than last year. Popular personal-size luxury car has 3.8 litre V6 as standard engine, offers new soft front and rear body color bumpers.

eights

Good news for gas economy fans and bad drivers

It's gonna be a great year for those of us who may not drive as well as we should. The '78s are smaller, more maneuverable, lighter, and have better brakes than ever before. Those of us who are extremely conscious of gasoline consumption will be pleased with the majority of Detroit's offerings this year, and with the reintroduction of the Z28, the super Trans-Am, and the new Turbo Buick, sports driving devotees get the best selections in years.

Government safety standards (which we hope to unravel in next month's DRIVER) may be scoffed at by some, but they are succeeding in making the game of driving a little bit more survivable each year. Detroit (and remember, we're pro-Detroit) may utter a small scream every time a new standard is created, but, by and large, the results have been very gratifying and should make '78 the best year yet in terms of crash survivability, and better yet, crash avoidance. Let's face it . . . until stricter and more comprehensive driver training and licensing procedures are adopted, engineering is the best way to reduce accidents.

Prices are up more than in previous years, the result of a higher inflation rate, both in labor and materials, and also as a result of research and development associated with emission and safety equipment. But, as a Chrysler executive brought out at the 5th International Congress on Automotive Safety, few things in life are free . . .

So, sit back, relax, and enjoy perusing the latest offerings from that bastion of American ingenuity, The Motor City.

New front and rear appearance of Camaro is achieved by body-colored soft nose section and rear bumper. Soft nose can really save pedestrians in low-speed situations. T-bar twin hatch roof is new option for '78. Engine options include 4.1 litre 6, and 5.0 and 5.7 litre V8.

DRIVER

THE TRAFFIC SAFETY MAGAZINE FOR THE MILITARY DRIVER

OCTOBER 1977

VOLUME 11 NUMBER 5

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DEPARTMENT OF THE AIR FORCE ■ HQ AIR FORCE INSPECTION AND SAFETY CENTER
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PUBLISHED IN COOPERATION WITH THE DEPARTMENT OF THE ARMY AND THE DEPARTMENT OF THE NAVY

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AFRP 127-1

Entered as a Controlled Circulation Rate Publication (USPS No. 335490) at Santa Ana, CA 92711.

SUBSCRIPTION—DRIVER is available on subscription for $8.65 per year domestic; $2.20 additional for foreign mailing, 75c per copy, through the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402. Changes in subscription mailings should be sent to the above address. Single copies will be sold and back copies will be furnished when available. Use of funds for printing this publication has been approved by Headquarters, United States Air Force, Department of Defense, Washington, D.C. No payment can be made for manuscripts submitted for publication. Contributions are welcomed, as are comments and criticism. Address all correspondence to the Editor, DRIVER Magazine, AFISC/SEDD, Norton AFB, CA 92409.

ATTENTION DEPT OF THE NAVY PERSONNEL: Address all queries concerning distribution to NAVSAFECEN, NAS, NORFOLK, VA 23511, Attn: Safety Publications Dept. All other correspondence will be welcomed by the Editor.

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Certain individuals shown in this magazine are not members of the Air Force and therefore do not conform to Air Force grooming standards.

THE EDITOR SPEAKS

DOUBLE CLUTCH

THE "SOFT" LOOK

Do you think about your tires as often as you should? They need more attention than almost any other part of your car. Oil changes and chassis lubes are needed only every 7,500 miles or so—maybe three times in two years. New cars can go about 20,000 miles before a tuneup—that's almost two years for the average driver. But tires are something else again.

You should check the air pressure *at least* once a month with a good quality air pressure gauge. A variation of as little as three pounds in either direction can cause unnecessary tire wear. Make a thorough inspection four times a year, looking for bubbles or cuts as well as uneven wear that means the front end alignment should be checked.

Don't be fooled by that soft or underinflated look that radials have. Because a radial bulges in the sidewalls even when properly inflated, it's easy to assume inflation is proper when it's not. For a radial to give top performance, it must be correctly inflated. Under-inflation causes the tire to run hot, reducing tread life.

All tires, regardless of construction or price, tend to lose air over a period of time. Remember, don't let that bulge in a radial fool you. It can lose air just like any other tire.

With the possible exception of brakes, tires mean more to the driver's safety and well-being than anything else on the car. Give them a thought.

safety and the '78s

continued

Mercury Zephyr is new this year, features 105.5-inch wheelbase, similar to now deceased Comet. Interior room is nearly equal to "personal-size" cars. Heavy-duty suspension helps handling while available 2.3 litre, four-cylinder aids mileage.

On its 25th anniversary, Corvette has reintroduced fastback styling. Completely restyled interior with more storage space, lift-out roof panels, and recalibrated suspension make it the nicest 'Vette in years. Built-in theft alarm system has been expanded to include the roof panels.

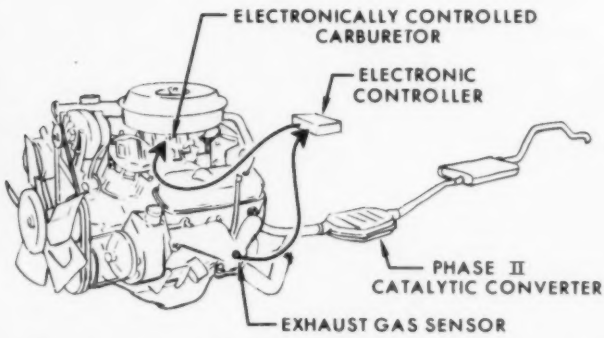
continued

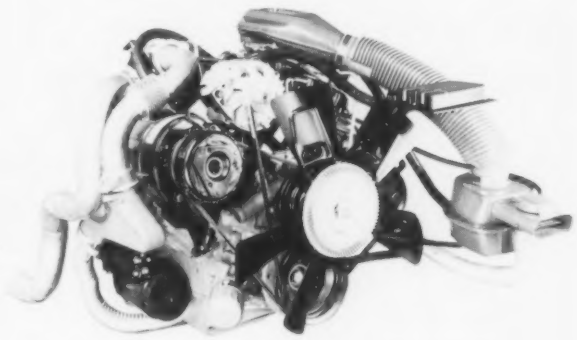
(left) New Malibu and Malibu Classic are a foot shorter and 500 to 900 pounds lighter than last year. Improved braking and handling result, as well as improved gas mileage. New standard engine is GM's 3.3 litre V6. **(right)** Four-passenger Plymouth Sapporo is brand new this year. Engines feature "Silent Shaft," counter-rotating weights that balance out engine vibration, and "MCA-Jet" combustion system that more thoroughly mixes air and fuel.

(left) Triple-section rectangular taillights, and adoption of Concours-design grille highlight Nova Custom series. **(right)** Always a standard, the Lincoln Mark series continues with the Mark V. Sharp styling combined with new tricks like a "miles to empty" fuel indicator make the Mark an exclusive and desirable automobile for a limited number of us.

(left) Monza adds two new body styles, an "S" hatchback and two-door wagon. Soft nose treatment, and new ventilated brake rotors couple with wider optional tires to make a safe, good handling package. **(right)** Until its spot was taken by the full-size Chevy last spring, the Oldsmobile Cutlass Salon was the best selling car in America. Cutlass for '78 offers a weight reduction of about 630 pounds and has increased head and leg room in both coupes and sedans. Standard engine for Cutlasses is the 231 CID V6.

One of the prettiest cars for '78, the Buick LeSabre Sport Coupe has standard 3.2 litre V6 with 5 litre V8 optional.

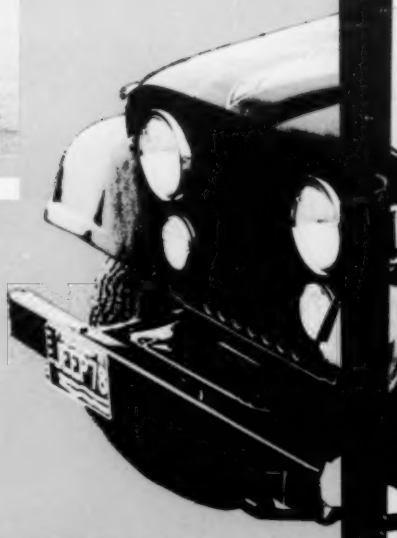




(left) Buick will use a Phase II emission control system on some Skyhawk models sold in California. System employs an exhaust system oxygen sensor, an electronically-controlled carburetor, and a rhodium/platinum catalytic converter. Mileage improvement is reputed to be two to three miles per gallon. **(right)** Buick's Regal Sport Coupe will be powered by this turbo-charged 3.8 litre V6. Exhaust-gas-driven turbo increases power on demand while permitting normal operation in cruise mode. Watch out folks, this could be the answer to mileage/pollution/horsepower problems.

continued

AMC's new Concord features medium-size 108-inch wheelbase and generous interior size. Hatchback model has over 31 cubic feet of luggage capacity.



(left)
One of the bigger news items this year is the inclusion of a diesel in the Oldsmobile lineup. The 5.7 litre diesel is available in the 88, 98, and Custom Cruiser models and should deliver a mileage increase of 25% over gasoline-powered models. With a 27.3 gallon tank, cruising range will be in the neighborhood of 600 miles.

Chrysler's popular Cordoba has 318 cid V8 coupled with their excellent Electronic Lean Burn ignition system. Other changes include an improved electrical system and a hefty weight reduction. Handy option this year is intermittent windshield wiper system.

78

Jeep Golden Eagle already has wide tires and spoker wheels, fender flares, roll bar, and fancy hood decal . . . you won't have to shop around at 10 different accessory stores to customize this one. DRIVER applauds use of dual outside mirrors.

American Motors Concept 80 Van isn't in production, but we thought we'd throw it in as a tease. Van would have four-wheel drive and almost unmatched versatility. If you like it, write to American Motors in Southfield, Michigan, and tell them so.

Magnum XE, by Dodge, is Chrysler's answer to GM's successful Monte Carlo. Bold styling couples with an "Open Road" package consisting of wider wheels and tires, fender flares and H-D suspension to give the Magnum XE a young style and feel.

Whenever possible avoid parking in dark, isolated areas of parking lots.

The well-lighted and heavily traveled areas of the parking lot offer the best protection from auto theft.

CAR THEFT

HERE'S A DRIVER MAGAZINE QUESTION:

by Capt JAMES J. LAWRENCE

What happens to one in every 128 automobiles registered in the United States? An Earl Scheib paint job? No. Here's another clue. Nineteen dollars of every family's automobile insurance premium is attributable to this. A car accident? Close, but not quite right. If it happens to you, it could result in a cost of as much as $600. Got it yet? The answer, friends is car theft.

"Car theft, so what," you say. "My insurance will get me another one." Or maybe your reaction is, "The old clunker isn't worth much. What thief in his right mind would want it?" These are examples of what the authorities call "public apathy," the number one problem in averting automobile rip offs. Apathy is also the reason—the main reason—why nearly one million vehicles were stolen in 1976 at an estimated value of over one billion dollars. Car owners just don't believe it will happen to them, so they don't care.

Car theft, as you will see, is not victimless. The victims are all of us. Let's check out the costs in numbers we can all appreciate.

As we said earlier, our automobile insurance premiums would be roughly $19 less annually if there were no car thefts. Furthermore, every stolen car costs the authorities an average of $740 in investigation, litigation, prosecution and perhaps jailing of the thief. Multiply that times the one million vehicles stolen in 1976 and you can see where a lot of our taxes are going.

Now let's look at what it can cost the car-theft victim. On the average, a car theft results in 16 hours spent by the victim for police investigations, reports and assorted red tape, insurance claims, and arranging replacement rentals. This, of course, doesn't account for any time lost from work. Figure out what 16 hours time is worth at your present wage.

Of the stolen automobiles recovered, one in five is either damaged or totally destroyed. A "totaled" car will cost you $50 to $100, depending on the deductible amount of your policy. Certainly you can count on any personal belongings in the car being lost forever.

A replacement vehicle is usually required and car rental costs may or may not be covered by your present policy. Towing and storage fees are also inevitable if the car is recovered. You can see where the $600 cost we mentioned earlier can be reached in no time at all.

continued

Why did auto theft, in 1976, rise at an annual nation-wide average of 18 per cent while the violent crime rate decreased at a rate of 10 per cent? Why has auto theft increased 160% in the past 16 years? The answer again is lack of public concern about the problem, an apathy unjustified when one studies the cost.

The remainder of this article will describe the car thief and lay a practical framework for beating him at his own game.

The Car Thief: Car thieves come in all shapes, sizes, and colors; however, they usually fall into two main categories: The joyrider and the professional. About three-quarters of all auto thefts are the work of the joyrider. The rest fall into the hands of the professionals. Let's look at the joyrider first.

The Joyrider: The police profile of the joyrider is that of an amateur out for kicks. Most of the time the thief is a male, 15 to 21 years old. He may have a high school education but often he's a dropout. He is most likely unemployed and still lives at home. Often the car he steals is located within nine miles of his residence. His target is usually an automobile 8 to 10 years old and valued at somewhere around $1500. (Sounds like your old clunker, doesn't it?) The odds against his ever serving time for this grand larceny are 76 to 1, so the joyrider often steals again and again.

He will swipe your car for transportation from point A to point B with joyriding in between. Your car will be abandoned, minus your personal property, when point B is reached, your car may have been in an accident, or the fuel tank may be empty. Sound like kids having fun? If you and your wife were mugged and relieved of $1500 worth of money and jewelry by a 15- to 21-year-old male, would it be just a kid having fun then? Of course not. Yet the public insists on virtually handing these vehicles over to these youthful felons.

Believe it or not, *eighty per cent of all cars stolen in 1976 were unlocked at the time.* More *Believe it or not?* Forty per cent actually had the keys sitting right there in the ignition. Easy targets are the main source of vehicles for the joyrider. Of particular interest are the quick stop areas like the Post Office, a fast food store, mini-markets, or the cleaners, where the car driver is likely to run in and leave his car running or leave the keys in the ignition. The joyrider sees his chance, jumps in, and is on his way.

The unlocked car is the next target, especially in a dark, quiet area with little traffic. The only obstacle is the ignition switch which can easily be jumped, using the knowledge acquired in high school auto shop or from fellow joyriders. (No, we're not going to tell you how to do it, but if we found out with little difficulty, so can the car thief.)

Forty per cent of the cars stolen in 1976 had the keys in the ignition. Removing the keys and locking the car door offers the best protection against the joyriding car thief.

Since 75 per cent of all auto thefts are committed by joyriders, we can substantially decrease the threat of auto thievery by simply removing the keys and locking all the doors. You get additional protection if you don't park on dark streets, at the far reaches of unlighted parking lots, or on lightly traveled roads. Elementary, my dear Watson.

If we all did these simple things, the cost of auto theft, which we all pay for in higher taxes, inflated insurance premiums, and loss of our vehicles, would be greatly reduced. Of course, your more inventive joyrider and the professional thief, who accounts for only a quarter of all auto thefts, would not be so easily deterred by these measures. Their sophistication calls for sophisticated defenses by the car owner.

The Professional: Like all professionals, the full-time auto thief is not easily stopped. His tools can be highly effective and his determination

A skilled car thief can jump the ignition switch in one minute or less. A well-concealed ignition kill switch could foil his attempt.

Always roll the windows up tightly when leaving your car. Entry for the car thief then becomes that much more difficult.

strong. If he wants your car, he will probably get it despite any precautions you may take. It is merely a matter of how badly he wants it. But you can make it difficult enough for him so that he will seek an easier victim.

Unlike the joyrider, the professional is taking your car for the money he can realize. Many thieves or auto theft rings work by special order. A request is made for, say, a front-end assembly (fenders, hood, bumper, grille and radiator) for a 1970 vehicle. This request may come from a fence, a body shop that knows it is dealing with a car thief, or may come over the legitimate body salvage teleprinter network. The professional then checks the local parking lots until he finds the year and model he is seeking. A quick check with the motor vehicle department provides the name and address of the vehicle owner (nice of them to be so cooperative).

A coat hangar or radio antennae inserted through the window seal makes an excellent tool for opening standard equipment door lock buttons. Install the thin, tapered anti-theft locks for best protection.

The vehicle is then located, stalked and stolen when it is convenient to do so. The requested part or assembly is sold at an excellent profit and the rest is usually fed into giant shredding machines and sold for scrap. This also, of course, destroys the evidence.

Another method of stealing involves auto registration fraud. The car thief buys a wrecked vehicle from an auction and gains a legal title of ownership. He then seeks out an identical year and model and swipes it. Next, he switches the vehicle identification number plate from the wreck to the stolen vehicle. He also changes the engine identification serial number (the technology for which is at his disposal). He can then easily sell this stolen vehicle to you, me, or the local used car dealer with little difficulty. Now that we have demonstrated their profit motive, let's move on to how they steal the cars once located.

The professional prefers the dark, quiet, isolated areas. There, time is much less critical. Say the car he's after is yours. Not wanting to be accused of apathy, you have locked your car after removing the key. The professional car thief is then faced with the problem of entering the vehicle and then starting it. Here his ingenuity begins.

Unlocking a door usually does not present a major problem. The top of a radio antennae or coat hangar bent in a hook shape makes an excellent opening device when inserted through the window seal and used to pull up the door locking button. Car thieves are also particularly adept at finding your hidden key cases. The locked door, therefore, presents little barrier to the professional. "No sweat," you say, "my car has the standard equipment steering wheel lock mechanism in the ignition lock."

The professional has two options here. The first involves the use of an auto body repair shop dent remover. Thirty seconds and the ignition switch lock pops out and is either replaced by one the thief brought along or the switch is merely jumped. For the less physically-oriented car thief, a set of key blanks, master keys, a key code book and a portable key maker can produce a perfect fit in very little time, once the thief ascertains your key identification number. Either way, he then simply drives off, strictly obeying all traffic laws, to his workshop to proceed with the stripping or transformation of your vehicle. Very, very few of these stolen vehicles are ever recovered once the thief leaves the scene of the crime.

Can you stop the professional car thief? Probably not if he really wants your vehicle. What you can do is make it difficult enough for him so that he seeks another victim.

HERE ARE SOME OPTIONS:

- Prominently display decals forewarning thieves that your automobile is protected by anti-theft devices (even if you don't have any). The cost of the decals is minimal and they can be found in most auto retail stores.
- Install slim, tapered door lock buttons on all doors, and lock them even when away from the vehicle only momentarily. These little devices cost around $3 a pair and are available at the auto section of most large department stores.
- Install different locks for the door and the ignition switch, if your car is not presently so equipped. The cost to change the door lock is usually about $15 at your local locksmith.
- Buy the standard micro-switch burglar alarm units for sale at department stores or auto retail outlets for $50 or less, if you have the mechanical ability to install it yourself.
- Get hood and trunk chain locks which cost around $5 and are easily fitted to most autos.
- Check out the various kill switches on the market. They can act as a second ignition switch or as a second fuel switch. The kill switch must be activated to start the car or keep it running, and if this secret switch is in a place not easily accessible or obvious to the car thief it can be quite effective as a time-consuming deterrent. These switches can be installed by yourself

continued

or at a retail store and the average cost is $10 to $30, depending on their complexity and your mechanical ability.

- Look for steering wheel locks, which connect the steering wheel to the clutch or brake pedal. They are readily available and cost between $15 and $20.

Other more sophisticated and more expensive electronic wizardy is available on the market; however, remember that the idea is to make things difficult for the thief in order to delay or deter him. Even the most advanced gadgetry can be overcome if the thief really wants your vehicle. Additionally, any of the above seven options or any combination thereof will pretty much eliminate the possibility of the joyrider ever getting his kicks at your expense.

Getting the Car Back: If the professional has your car, lots of luck. Retrieval is unlikely but you can increase the probability in several ways. Mark your car in several hard-to-find spots with your driver's license number (this is easier to trace than your social security number). You can also drop your business card down the window slot on the driver's side. These actions will ease vehicle identification, even if the auto was painted or had the serial numbers switched.

Several communities have instituted Auto Theft Prevention Programs to help curb the increasing consumer costs. Consult with your local constable or the Security Police and see if such a program is available. Two cities, Boston and Los Angeles, are presently running a Hands-Off-This-Car (HOT CAR) Club. They offer free or low-cost anti-theft devices as well as substantial monetary rewards for information leading to the arrest of thieves who have ripped off a club member's automobile. The programs include public notification and description of these stolen vehicles via local radio and television stations. Boston's program has been particularly successful, resulting in a 23 per cent drop in auto thefts in 1976, while the rest of the country's rate was increasing at a staggering 18 per cent.

To put this all in perspective, car theft is a problem that concerns each and every one of us. If your civic conscience is not aroused, then think in terms of the extra insurance premium you pay because of car theft or the $600 it could cost you if your car is stolen.

HERE IS A CHECKLIST TO THINK ABOUT:

- Always park in a well-lighted, traveled area.
- Keep the windows tightly closed.
- Never, never, never ever leave your keys in your car.
- Always lock your car, even when running short errands.
- Keep valuables out of plain sight.
- Install slim, tapered door lock buttons.
- Think of investing in one of the many kill switches available on the market.

Following these stimple steps will pretty much insure you will never be faced with the frustration and aggravation of stepping into a parking lot and finding you have become an involuntary pedestrian.

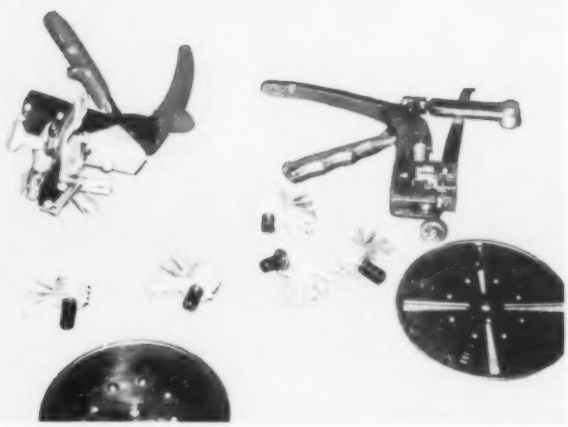
An ignition kill switch is installed by a Montgomery Ward mechanic. The installation takes about 20 minutes to complete. This device will prevent thieves from hot wiring a car to get it started.

Hot Car Club applicants from the Los Angeles area receive free anti-theft door lock buttons to prevent car thieves from using a coat hangar or other devices to gain entry. The Hot Car Club decals are also free to all members. An ignition kill switch is available at cost. Hot Car is co-sponsored by TV Channel 2, Crocker Bank, and KFWB Radio, in cooperation with the Montgomery Ward Stores of Southern California.

A Felon's Garden of Car Theft Tools

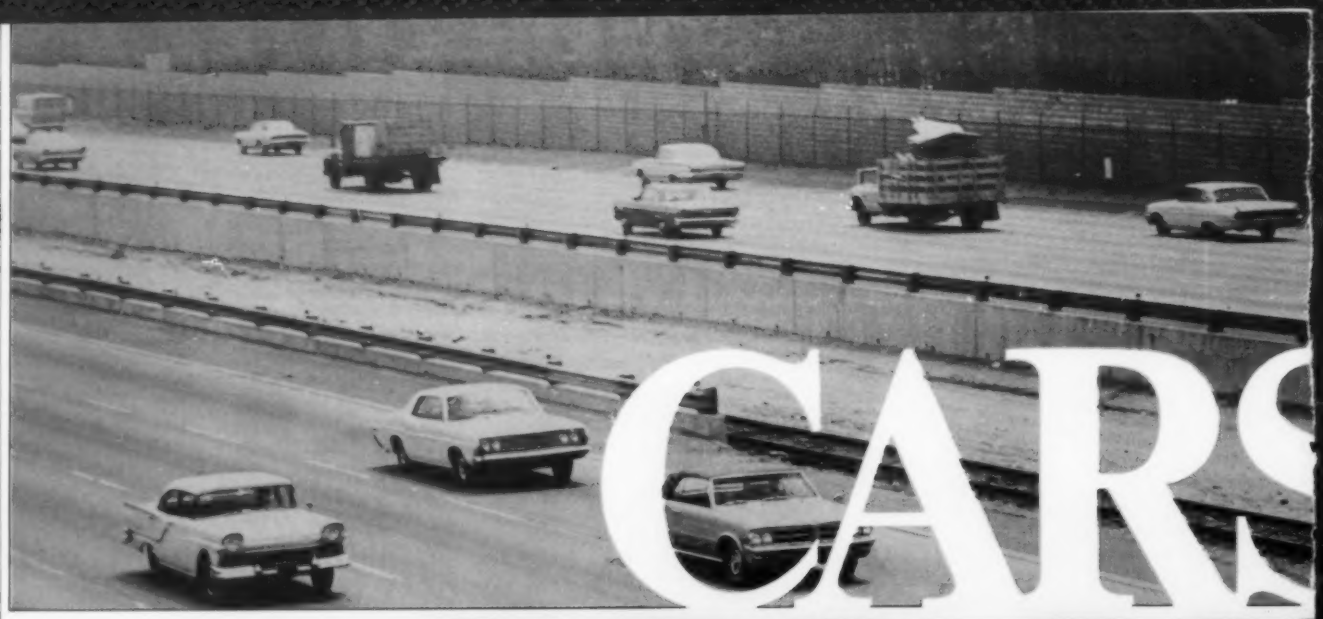
An auto body shop dent remover serves as a highly effective tool for auto thieves. Ignition switches can be removed in a matter of seconds and then the wires are easily jumped to start your car.

Key code books are available on the retail market. The thief finds your key identification number in your car owner's manual or on the vehicle identification plate. A perfect duplicate is then produced for use when the theft is convenient.



A portable key-making machine can produce key copies on the spot. An experienced car thief can use the key code books and this machine to create an exact duplicate in a matter of minutes.

Using these tools, the car thief can pick any door lock in very little time. Parking in a well-lighted and heavily-traveled area will discourage him from trying.



CARS

BIG VS

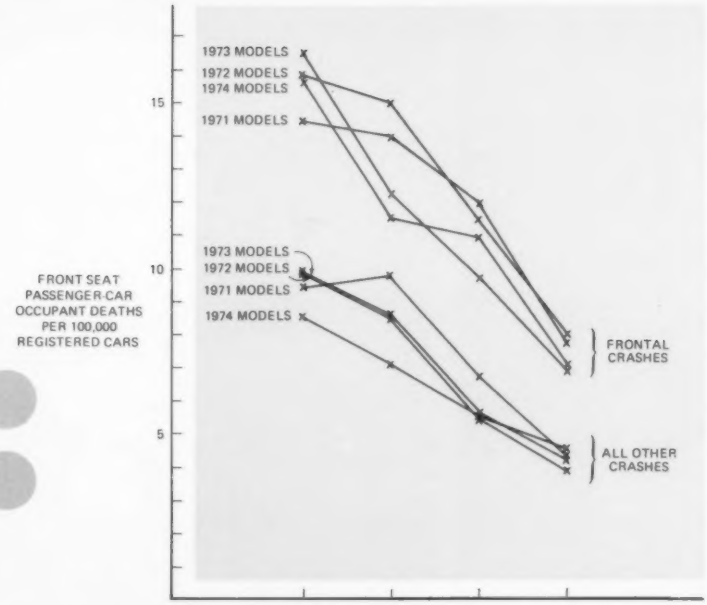
Imagine this: Your guardian angel pops up at the foot of your bed tonight with some bad news. He's been checking tomorrow's schedule and sees you're slated for a freeway collision in the morning involving a Cadillac and a Volkswagen. Not much he can do about it, says he with a shrug of a wing, but he can let you choose which car you'll be in.

How long do you hesitate before you pick the Caddie? Probably not over a second, because you don't have to be an automotive engineer to bet the big car offers you more crash protection.

"Ah ha, a put up pretend," shout all you small-car fans. "Big cars cause accidents and damage us little guys. But how about our maneuverability? If *I* were driving the VW, there wouldn't *be* a collision!"

Well, you know the argument. And we know we can find a study in our files to support any side you want to take. Nevertheless, the statistics are mighty convincing that the more inches to your wheelbase the less chance of a fatal injury (see chart). Notice we are talking about size, not necessarily weight. Some engineers say a big, lightweight car is still safer that a small, lightweight car.

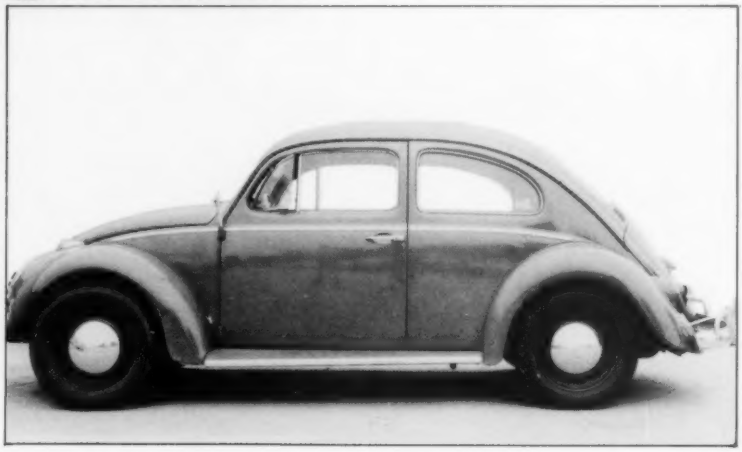
This whole subject is on our minds for two reasons: First, federal laws require auto manufacturers to improve fuel economy steadily (27.5 mpg by 1985) and the most direct way to do that is to make cars smaller. So small cars are inevitable. Second, the federal government has ordered auto makers to provide passive crash protection (air bags or automatic belts) in all new cars with 115-inch wheelbase or greater by September 1981. All new cars, regardless of size, will not be affected until 1983. Since a wheelbase of 115 inches or more means top-of-the-line, standard-sized cars, it appears that for the next few years larger cars will have an even greater safety edge than they do now.



U.S. FRONT SEAT PASSENGER-CAR OCCUPANT DEATH RATES BY CAR SIZE – 1971-74 MODELS IN CALENDAR YEAR 1975[1]

1 SOURCE: NHTSA FATAL ACCIDENT REPORTING SYSTEM AND R. L. POLK NATIONAL VEHICLE POPULATION PROFILE, JULY 1 1975. IIHS, April 1977

• small



Safer small cars *can* be built. For example, Minicars, Inc. is a company designing research safety vehicles under government contract. Minicars found that simply by stuffing crushable polyurethane foam under the body steel, they could enable a Pinto to protect its occupants in a 50 mph barrier test. And that's with little increase in vehicle weight. The foam is still expensive though. About $6 a pound. With enough demand, the price could drop to a dollar a pound. But if we're talking about 200 pounds of foam, that's still a significant price increase for the buyer.

Calspan Corporation is another company building research safety vehicles for the government. The head of that program, Dr. Patrick Miller, says that the larger car may offer extra protection to its occupants but it does more harm than good because it creates an extra hazard for others on the road. Dr. Miller believes the large car will gradually disappear because of energy requirements, but that meantime it should be designed so that it won't cause so much damage to a small car in a collision. (Think that's likely?)

The larger car has some defenders. Dr. Donald Reinfurt of the University of North Carolina says big cars can't take all the blame on the accident scene. He says that many people believe that a small car striking a small car is the same or milder a collision than a big car hitting a big car. But that's not true. In terms of serious injury, a driver is twice as well off in a crash between two big cars as he would be in a collision between two small cars.

As we said earlier, there is a study around to support almost any position. For instance, records of more than 700,000 accidents in New York state (1969-1970) show that occupants of the smallest cars suffered almost three times as many serious and fatal injuries as occupants of the biggest cars. *But* the study also shows the biggest cars were involved in up to 50% more accidents than the smallest.

Very interesting, especially to the "smaller-is-better" bunch, except that a California study failed to turn up any difference at all in accident rates for different sized cars.

Then there are the figures from the casualty insurance companies, which show that subcompacts have a higher claim frequency than full-sized cars, even after the statistics are adjusted to compensate for the younger age of subcompact drivers (younger people have more accidents).

What does all this mean to you, the average car buyer? For one thing it means that when you buy a small car—and if you haven't, you will—you should look at it in terms of crash avoidance. What kind of brakes and how well can you decelerate? How about suspension, structural design, handling?

Insurance companies are beginning to fix premiums by collision and comprehensive claims costs on each make and model. Allstate, for instance, will send you a list of cars they charge more for insurance and those they charge less for. If you're a serious car buyer, you might write Allstate at Northbrook, Illinois 60062. Their data does not indicate what the costly factors on a particular model are, but simply that the model is more or less expensive than average in its class in terms of insurance claims.

We've saved our favorite statistic for last. Remember when your guardian angel asked you if you wanted to be in the VW or Cadillac when the collision came? You should have asked him about wearing restraints. If you get to wear your belts in the VW but not in the Caddie, your chances are about the same in either car!

(Some of the information in this article pertaining to studies first appeared in *Family Safety*, a publication of The National Safety Council.)

AUTOMOBILE INSURANCE COVERAGE

by
Capt James J. Lawrence

Automobile insurance. If you own some, then you must know all about it. Anyway, that's what I thought until I decided one day to read the policy for myself. The first step was finding it. After rummaging through five shoe boxes filled with years of old receipts and cancelled checks, I finally discovered it lurking in a carton, beneath my seventh grade report card and some dirty gym socks. As I struggled through the legal jargon, it occurred to me just how little I really knew about this product that I so willingly pay hundreds of dollars for each year.

I decided the time was right for a little self-illumination and, if your time is right, this is the article for you. My research unveiled the numerous misconceptions I had on the nature of the insurance coverage I purchased and opened my eyes to what my insurance dollars really bought. I also discovered that my conception of what "No Fault Insurance" meant was everything but accurate.

Let's begin with a brief explanation of the types of coverages and then see what you can do to keep the cost down to a minimum. On examination, you discover your policy allows for $50,000/$100,000/$5,000 liability limitations. This means that your company will not pay more than $50,000 to any one person hurt in an accident, more than $100,000 to all people hurt, or more than $5,000 for all the property damaged. Keep in mind that these liability limits do not cover your car. They cover the judgments for damage or injury caused *by* your car. Remember also that if a court awarded $60,000 to one person for bodily injury inflicted by your car, the insurance company would pay $50,000 and you would be personally responsible for the remaining $10,000.

Medical payments coverage is also included in most insurance policies. Within the limits specified in the contract, this coverage pays for the costs of all medical expenses incurred by you or the passengers in your vehicle resulting from an accident. It will also cover medical expenses you or members of your family covered in the policy receive while injured in someone else's car. This second insurance feature is for the amount over that which the driver's insurance company is obligated to pay.

Comprehensive coverage insures your car against almost all losses, except for those involving collision. For example, it covers loss or damage from fire, theft, vandalism, and storms. Read your policy carefully, for often there is a deductible, meaning you pay the amount of the deductible to repair the damage and the insurance company pays any excess. For example, if you

must replace a $150 windshield, you might pay the first $50 and the insurance company would take care of the rest.

Collision coverage is an insurance option, yet it is often required by the people who lend you the money to buy a car. This coverage protects the car itself, if your vehicle is involved in an accident. You are insured for the full amount of the damage to your car, but there is always a deductible amount that must be paid by the policy holder.

These are your basic types of automobile insurance coverage, but how about the cost? We all know that insurance does not cost the same for everybody. Here's why: Insurance is a gamble. The company bets that you will not have an accident and you bet that you will. But like Las Vegas, the company does not like an even odds bet; that way the percentages may be in your favor. They assign odds against you based on the accident records of you and people similar to you in terms of sex, age, territory of residence, marital status, driver education, etc. The driving records of your peers determine what the odds are that you will have an accident. The greater the odds, the more the insurance company will charge you to play the game.

Many people are outraged by this group rate setting, especially the individual with a good driving record who simply resides in an area where there are a large number of insurance claims. Such is the plight of the inner-city car owner. The insurance company feels that drivers living in these high-risk territories must pay the price. The only alternative is to make the more rural customer pay higher rates to help offset the inner-city costs. Insurance companies think that would be unfair.

Whatever your argument, the maximum rating factors are established by each state's Insurance Board and are not negotiable between the insurer and the insuree. We are what we are and where we are, that cannot be changed. Nevertheless, there are discounts available and you should be aware of them and take advantage if you qualify.

Suppose, for example, you are a youthful operator, or have a son or daughter who puts you in this category. A good-student discount is a possibility. The typical 17-year-old male will pay a 3.50 multiplication factor for insurance. If the basic insurance rate is $100 per year then his cost would be $350. With the good-student discount, the insurance rate would be $270, a substantial reduction. To qualify for this savings, the young operator must be ranked in the top 20 per cent of his class, have at least a B average, or be mentioned on the dean's list or honor roll.

A Driver Training Certificate will also be worth a reduction in premium for youths up to the age of 20. This discount, coupled with the above good-student discount, could result in a yearly premium of $250, $100 less than the insurance expense without discounts.

Marital status has a large impact on the cost of insurance. A married 23-year-old male will pay just under 60% of what the unmarried 23-year-old male must pay for identical coverage. Females fare even better as far as insurance ratings are concerned. A married woman is treated as a non-youthful operator.

Driving safety records also play a significant part in determining insurance cost. A driver is placed in a number value subclass based on a point

continued

Types of Automobile Insurance Coverage:

Liability Insurance—Specific amount coverage which protects you against claims for damage or personal injury caused by your car.

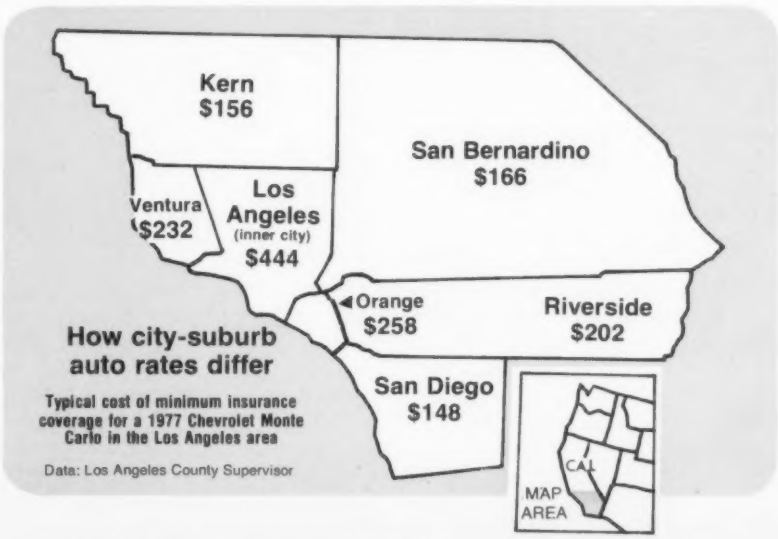
Medical Payments Insurance—Specific amount coverage which pays the costs of any medical expenses you incur resulting from a vehicle accident.

Comprehensive Insurance—Protects your vehicle against all losses with the exception of those involving collision. Examples are theft, vandalism, fire and storm damage.

Collision Insurance—Protects the car itself for damages received in an accident. Usually the insuree pays a deductible amount and the insurer covers all expenses over and above that amount.

(left)
Driver Education Courses offer the youthful operator exposure to driving rules as well as defensive driving techniques. Successful completion on one of these courses may also result in a discount in their auto insurance premiums.

TERRITORIAL RATING FACTORS



Los Angeles County auto insurance costs as much as four times that in neighboring counties for identical coverage. The large number of claims for the inner city area has forced the premiums well above those of neighboring communities.

automobile insurance coverage

continued

system, and that subclass determines the multiplication factor for his coverage.

One point is assigned for each accident caused by the policy holder which results in bodily injury, death, or damage in excess of $200. One point is also charged for a moving violation resulting in license suspension or revocation.

Two points are allotted for an accumulation of citation conviction points which result in the requirement to file evidence of financial responsibility with the state.

Three points are assigned to anyone convicted of driving while under the influence of drugs or alcohol, for failure to report an accident, or when cited for driving with a suspended or revoked operator's license. A driver with a point standing of four can expect to pay over two times the premium of his counterpart with a good-driving safety record.

Aside from these discounts and maintaining a good-driving record, insurance costs can be further reduced. If you purchase a policy with higher deductible amounts for collision or comprehensive coverage, annual policy cost savings are possible for the safe driver. Of course, a claim will be more expensive to you under this policy. You can also shop around for your best insurance buys. Maximum rates are established by law but many companies offer lower rates because they are especially efficient or operate without salesmen and their commissions. When shopping, make sure you are comparing like coverages for similar dollar costs. If you can manage quarterly or semi-annual premium payments instead of monthly, you can also save a little money.

So that's my basic Insurance 101 course. Now I know more and so do you.

The second area of significance is the concept of "No-Fault Insurance." This will be a bit tougher because even the experts have not yet agreed on the merits and weaknesses of this plan. Presently 16 states have some form of bonafide no-fault insurance. Eight other states have laws which provide for a modified form of such coverage.

Basically, no-fault insurance allows an insured motorist to collect on personal injury claims no matter who is at fault. These claims are to be paid by his own insurance company. The new theory is that the fault system is a wasteful arrangement that encourages costly lawsuits. Essentially, the plan restricts your right to sue the other person in an accident under your state's fault laws, in exchange for your right to be compensated by your own insurer, even if you are to blame for the accident. These "no fault" provisions normally apply only to bodily injury claims, while property damage claims are settled by the standard liability and collision sections of your policy.

Under the no-fault plan, lawsuits for general damages are allowed only if medical costs, wage losses, and expenses exceed a certain amount – called the threshold – or if you suffered serious injury or permanent disfigurement. The idea is to keep the smaller accidents away from the courts and discourage costly lawsuits by offering speedy compensation. The threshold amounts in the 16 no-fault states differ drastically.

The eight states with modified no-fault plans allow for some form of personal injury protection for medical, hospital, and funeral expenses as well as wage loss. The injured party is free to sue for additional costs and general damages over that compensated by the personal protection plan. Many legal groups favor these add-on-no-fault laws over the true no-fault concept. They feel that these are much more desirable than a limitation on one's right to sue for damages.

The question now comes up, "Is no-fault automobile insurance working?" In June of 1977, the Department of Transportation released some findings following a study of the experience in the 16 no-fault states.

They concluded:

- No-fault automobile insurance does work.
- Benefits are more adequate and

continued

EFFECT OF DRIVER SAFETY RECORD ON RATING FACTOR*

Risk Code	0	1	2	3	4
Single Car	0.00	+0.40	+0.90	+1.50	+2.20
Multicar (for each car)	−0.15	+0.05	+0.30	+0.60	+0.95

*Multiplication factor can be converted to percent by moving decimal point two places to the right.

The driver with a poor safety record can expect to pay twice the premium of the safer driver. A rating over 4 may result in cancellation by your insurance company or assigned risk status. (An "assigned" risk is a driver whom the state actually assigns to a particular company. Each company must carry its share of drivers considered poor risks; premiums are higher.)

(left)
Driver Education Courses offer the youthful operator exposure to driving rules as well as defensive driving techniques. Successful completion on one of these courses may also result in a discount in their auto insurance premiums.

EXAMPLES OF MULTIPLICATION FACTORS USED TO DETERMINE AUTO INSURANCE RATES

	1. Effect of good-student discounts		2. Effect of driver-training discount		3. Effect of marital status		4. Effect of driver's sex	
Age	With discount	Without discount	With training	Without training	Married	Single	Male	Female
17	2.70	3.50	3.10	3.50	1.95	3.50	3.50	1.75
18	2.50	3.30	2.90	3.30	1.85	3.30	3.30	1.60
19	2.30	3.10	2.70	3.10	1.75	3.10	3.10	1.50
20	2.10	2.85	2.55	2.85	1.65	2.85	2.85	1.25
21	2.05	2.50	2.50	2.50	1.50	2.50	2.50	1.15
22	2.00	2.35	2.35	2.35	1.40	2.35	2.35	1.10
23	1.95	2.20	2.20	2.20	1.30	2.20	2.20	1.05
24	1.90	2.05	2.05	2.05	1.20	2.05	2.05	1.00
25	†	1.90	1.90	1.90	†	1.90	1.90	1.00
26	†	1.75	1.75	1.75	†	1.75	1.75	1.00
27	†	1.55	1.55	1.55	†	1.55	1.55	1.00
28	†	1.40	1.40	1.40	†	1.40	1.40	1.00
29	†	1.25	1.25	1.25	†	1.25	1.25	1.00

†Classified as nonyouthful driver.

Multiplication factors determine the total amount of your premium. The base insurance rate is multiplied by your rating factor to determine the cost of liability insurance coverage.

equitable in the states that have adopted the new approach.

- Payments are more prompt.
- The cost efficiency of administering auto insurance benefits has improved.
- The burden on the courts and lawyers has been reduced as litigation has declined.

The opponents of no-fault, meanwhile, claim that the rising premium rates in no-fault states prove that this system is no better than the old fault system. Backers of no-fault blame the skyrocketing costs of medical attention and auto repairs for increased insurance cost and point to the "fault" states that have experienced similar rate hikes to support their argument.

Federal no-fault automobile insurance legislation was first introduced seven years ago. No proposal has yet come close to being enacted into law. Provisions require that all vehicle owners carry no-fault insurance for personal injury and that civil suits for pain and suffering be forbidden except in cases of death or serious injury.

Supporters of this bill feel that federal law will mean lower nationwide insurance premiums, will speed payment of claims, and will reduce the present clogging of courts with nuisance suits. Opponents contend that insurance regulation is a matter that should be left to the states and that federal no-fault might actually raise insurance rates. Whether or not 1978 will be the year for federal no-fault insurance laws remains to be seen.

So that's what I found out about automobile insurance. Comparing my policy to those of friends using different companies revealed that the benefits and provisions are in no way identical. Take a few minutes to look yours over and discuss your needs and requirements with an agent or company representative. The result may be highly beneficial.

These 24 states have some form of no-fault insurance laws. The 16 with asterisks have bonafide compulsory no-fault legal requirements for drivers with a vehicle registered in that state.

VEHICLE RODEO

by
Sgt Frank Forester
SSgt George Sisley

The pylon obstacle looks even harder from inside the truck.
USAF photo by Sgt James R. Pearson

A1C Mark Rebuck directs his driver with the spirit of a New York City traffic cop.
USAF photo by Sgt James R. Pearson

Since time began human beings have tested their strength and skill against the beasts around them. What could be more logical than that we now pit our strength and skill against the mechanical beasts we have created?

One average-weight modern man versus one six-and-one-half ton, ill-tempered, spiteful, cantakerous mechanical monster that is more than willing to bite the hand that feeds it. Requirements for this contest: one valid Patrick AFB driver's license, one set of fatigues with gloves (highly recommended), one assistant, and enough courage to put it all on the line at the 2d Combat Communications Group's (2CCG) Vehicle Rodeo.

This rodeo involved no calf roping or bull riding and the only bucking broncos were the M-35 trucks. The "cowboys" were all volunteers who thought they could put one of these big green "broncos" through a difficult obstacle course faster and with fewer mistakes than anyone else.

The course, approximately a half-mile long, consisted of driving through and around pylons, barrels, and barricades. There was parallel parking and backing onto a simulated aircraft load ramp. It sounds difficult and it was. It was also much like the driving conditions any member of the 2 CCG might run into on a major deployment.

Colonel Ronald B. Youse, commander of the 2 CCG, initiated the vehicle rodeo. According to Col Youse, "Many organizations throughout the Air Force whose primary mission is equipment-oriented have competitions to identify a 'top gun.' These competitive events range in size from unit to major air command competition. Since driving is an integral part of the job in a Combat Comm unit, I felt we should be able to derive substantial benefits in the areas of safety and training from a vehicle rodeo. And, besides, it should be fun."

Although most contestants entered for the fun and challenge of the competition, the safety and training aspects were never forgotten. The drivers and spotters (shotguns) performed maintenance and safety checks on their vehicles before starting the obstacle course. If one small detail of the pre-start inspection was neglected, the contestants were immediately disqualified. The maximum speed allowed on the course was 15 mph. Most drivers averaged about 2½ to 3 mph over the one-half mile course. That doesn't include time added to the scores when an obstacle was bumped.

Winners were determined by adding the time spent on the course to the penalty time added for mistakes. The winning driver was TSgt Jerry A. Rendall, his spotter was Sgt Gregory St. Cyr. The Ground Radio Repairmen ran the course in 7:07 minutes but had 130 seconds added for penalties for a total time of 9:16 minutes. Second place went to Technical Controllers, A1C David Rosado, driver and Sgt Timothy B. Zimmerman, spotter.

THE ELECTRICAL SYSTEM, PART 1

THE BATTERY CHARGING AND STARTING CIRCUITS

Rather than begin this article by introducing you to basic electricity, we're going to refer you to some material that will explain about all those ol' electrons and amps and volts, etc. That way, we can devote the space to theory and troubleshooting of your car's electrical system, and you can have plenty of time to absorb the fundamentals of electricity at your own speed.

If you're up on your amps and volts, skip this paragraph. If you're a novice at electricity or need a refresher, head out to your base library and read up on the following suggested texts:

Practical Electricity, by R. G. Middleton (Audel)

Electronics, by Robt. Irving (A. Knopf)

The Motor Car, by John Day (St. Martin's Press)

Any of these volumes will give you a thorough grounding (no pun intended) in electricity. Also, many Armed Forces career fields have excellent tests that you could perhaps borrow from a squadron, and the AF Extension Course Institute has some absolutely super courses that you can take.

What We'll Cover: There are seven basic circuits in an automobile (or truck, or motorcycle if you don't count the windshield wiper circuit). They are: the charging circuit, the starting circuit, the ignition circuit (covered in the February and March '77 issues of DRIVER), the horn circuit, the lighting circuit, the instrument circuit, and the electric windshield wiper and washer circuit.

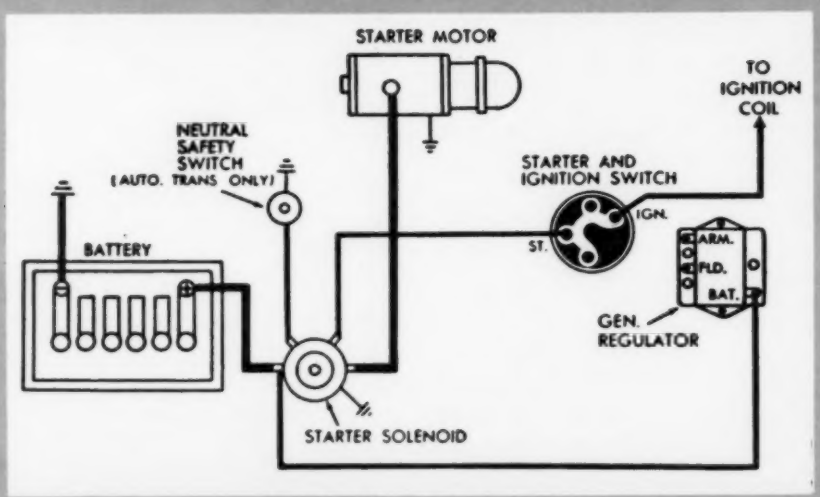
In this issue, we'll cover the two most complicated ones, the ones that in conjunction with the ignition create the most problems: the starting and charging circuits.

The Starting Circuit: As the name implies, this circuit consists of the bits and pieces necessary to start your car. It includes the starting switch (or solenoid), the ignition switch, the starter motor, the battery, connecting wires, and in most cases, the frame of the car.

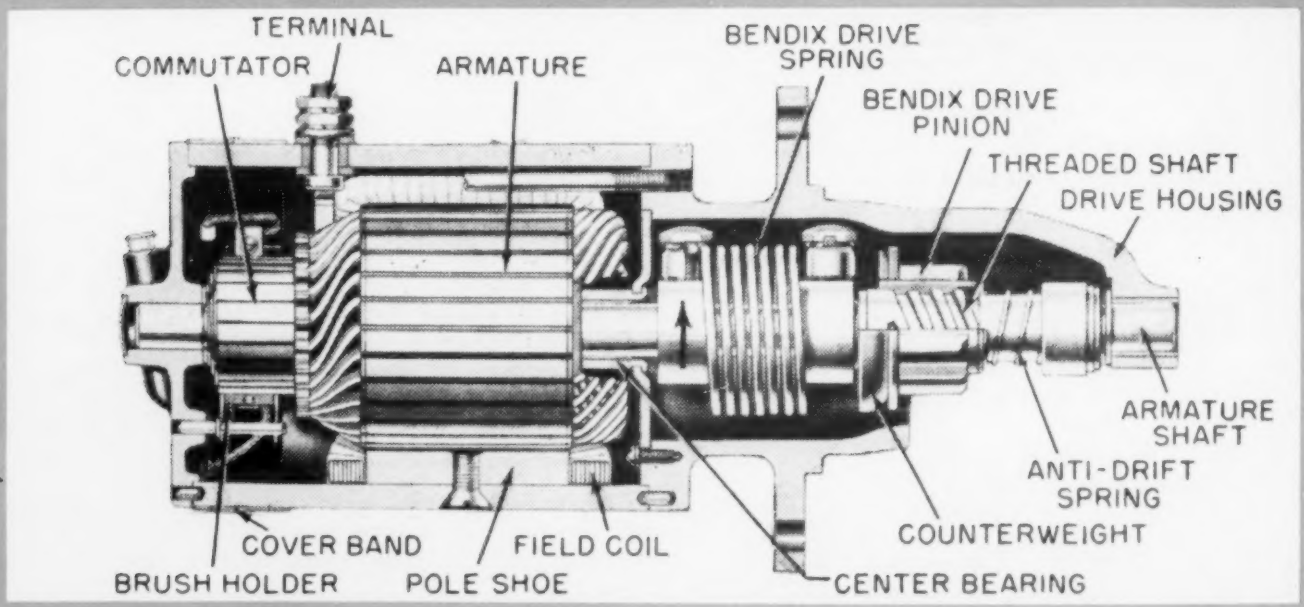
The starting circuit is designed to carry high current (and as we all remember, current is what can really bite you) with a minimum loss of voltage. The battery supplies power to the starter motor which must crank the engine. The ignition switch directs the current from the battery through the starter solenoid and then to the starter. The starter must have a system that engages it with the engine flywheel and disengages it when the engine begins to run on its own.

The Charging Circuit: Components of the charging system include the battery, generator, voltage regulator, ammeter (or idiot light), wiring, and again, the frame of the car.

There is another component to this system and it has, for all practical purposes, replaced the generator. It is called an alternator, and its function is the same as that of a generator. It generates electricity to recharge the battery and run the other electrical circuits.



Typical starting circuit diagram shows which wires to check when shorting or bad connections are suspected.

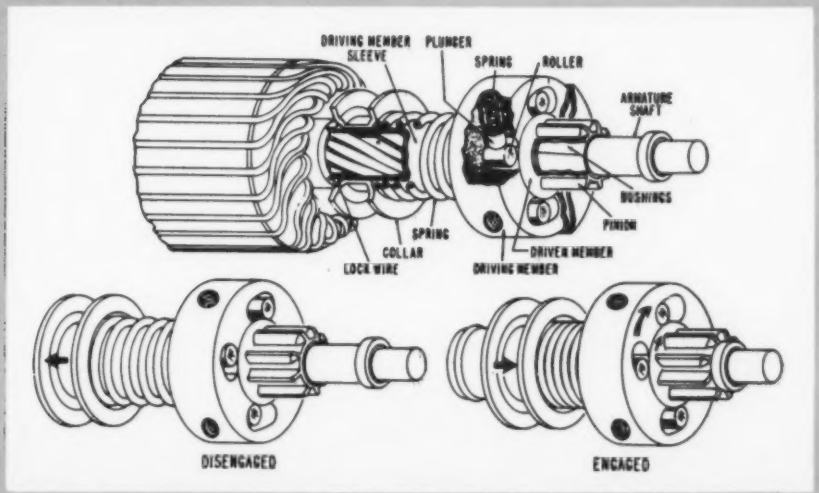


Specifics/Starting Systems: The starter itself is actually a small but very powerful DC motor. When you turn the ignition switch to the "start" position, a small current flows from the battery through the switch to the starter solenoid. The starter solenoid is actually a switch, too, but because it must carry high amperage to the starter, it is not a hand-actuated switch. The current from the ignition switch that flows to the solenoid (which can be located either on the inner fender well or integral with the starter itself) electro-mechanically actuates a plunger. This plunger actually operates the contact points of the solenoid which then contact each other and allow the high amperage from the battery to flow to the starter motor.

When the solenoid contacts are closed and current flows to the starter, the starter armature (the center portion of the motor) rotates. On one end of the armature shaft is a gear (called the pinion gear) which is automatically meshed with a gear on the outer edge of the engine flywheel. The motor turns the pinion gear which in turn drives the flywheel gear, causing the engine to turn over.

The ratio between the flywheel gear and the starter pinion gear is about 15:1, which means that once the engine starts the engine drives the starter armature 15 times as fast as the engine rotates. Even though a just-started engine rotates at a moderate speed (about 750 revolutions per minute, or RPM), the corresponding starter armature speed would be in the neighborhood of 11,250 RPM, high enough to damage the arm-

continued



Overrunning clutch drive is used in place of Bendix drive in FoMoCo-type late model starters.

ature because of centrifugal force. So, we also need a method of disconnecting the starter pinion from the flywheel when the engine begins to run.

Bendix Drives: The Bendix drive, named after the man who invented it, is a system whereby the pinion is meshed and unmeshed with the flywheel by a method similar to threading a nut on a bolt. If you hold a bolt in one hand and spin a nut on it with the other, the nut will move up or down the bolt depending on the direction of rotation.

The pinion gear represents a large nut which is mounted on the threaded armature shaft. Sudden rotation of the armature causes the pinion to move out from the starter armature end and mesh with the flywheel gear. As soon as the engine starts, it spins the pinion out of mesh because of the high speed at which the flywheel gear rotates the pinion. The pinion then spins back to the left, out of mesh.

Starter Troubleshooting: Starter problems usually lie in three areas: the battery, the starter itself, or the wiring and components in between. To quick-check the starter system, turn on the headlights. They should burn with normal brilliance. If they don't, the battery may be low . . . check it out with a battery hydrometer.

If the battery is in a charged condition and the lights burn brightly, one of three things should happen when you operate the starter while someone checks the lights. The lights will: A, go out; B, dim considerably; or C, stay bright without any cranking action taking place.

If the lights go out as the ignition switch is moved to the "start" position, it is an indication that there is a poor connection between the battery and the starter motor. This poor connection can usually be traced to bad conditions at the battery cable/battery post connection. Remove the cable clamps from the terminals (ground lead first), check for corrosion and clean if necessary. Check the other ends of the battery cables where they go to the solenoid, starter, or ground (usually the engine block). Clean and retighten all connections.

If the lights dim considerably as the starter is operated and the starter turns slowly or not at all, or if a chattering or clicking noise is heard coming from the solenoid or starter, you probably have a low battery. Another possibility is that there is some mechanical condition in the engine or starter itself that is throwing an unusually heavy load on the battery with resultant dimming of the headlights.

Check the battery with a hydrometer. If it is fully or nearly charged, the trouble probably lies in either the engine or starter. In the engine, tight bearings or pistons, or cold, heavy oil may be sufficient to cause the problem. Low outside temperatures can cause the low battery indications, too, because a battery is much less efficient at low temperatures and the engine is harder to crank. Those of you stationed at Williams AFB or Ft. Huachuca can probably disregard that last cause.

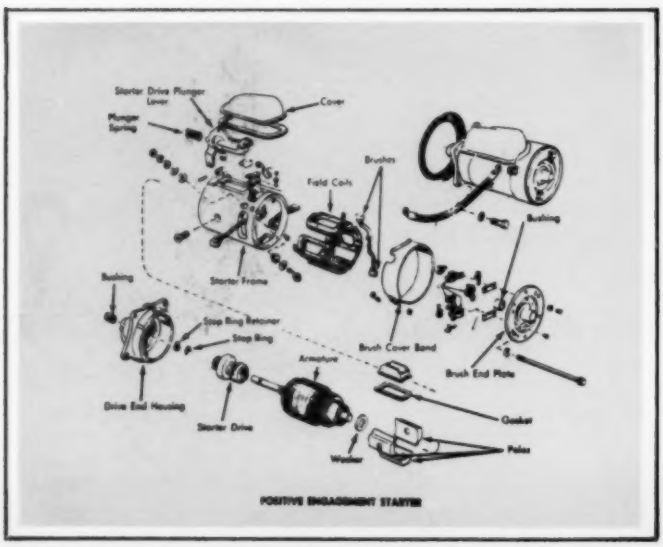
Inside the starter itself, a bent armature shaft, loose pole screws, or worn bearings may cause the armature to drag. Other internal problems may consist of thrown armature windings or commutator bars.

A further cause of slow cranking may be engine backfire resulting from the timing being advanced too far. To guard against failures internally in the starter, be sure you wait a few seconds after a false start to be sure the pinion has disengaged, and if backfire is causing the damage, re-time the engine.

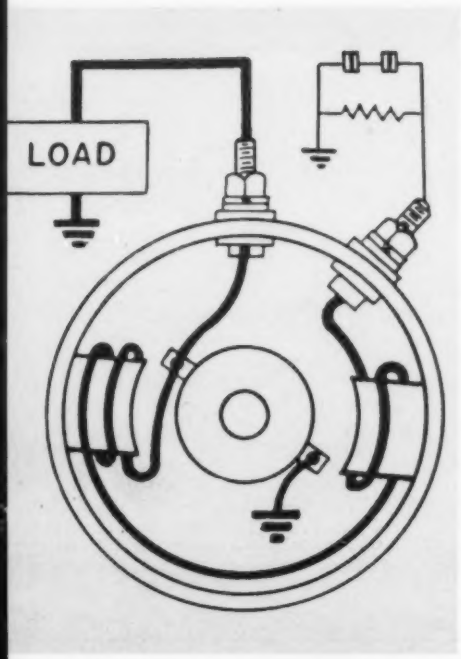
If the lights stay bright and no cranking action results when the key is moved to the "start" position, it's a good indicator that there is an "open" in the circuit at some point. If the car is equipped with a solenoid switch, the solenoid control circuit can be jumped by placing a heavy (at least 10 gauge) wire across the solenoid main terminals. This should result in cranking action, but not a start (ignition key in "off" position).

If the starter does not operate with the solenoid jumped, chances are that it will have to be removed from the car for troubleshooting. One other thing to remember on a brightlight, no-crank situation is that the neutral/start switch mounted on the steering column (or shift linkage) may be bad. With the ignition key held in the start position, move the gear shift lever about the neutral quadrant. If you still have a no-crank, release the key and move the lever to the "park" position on automatic transmission-equipped cars and repeat the "hold-key-and-wiggle" trick.

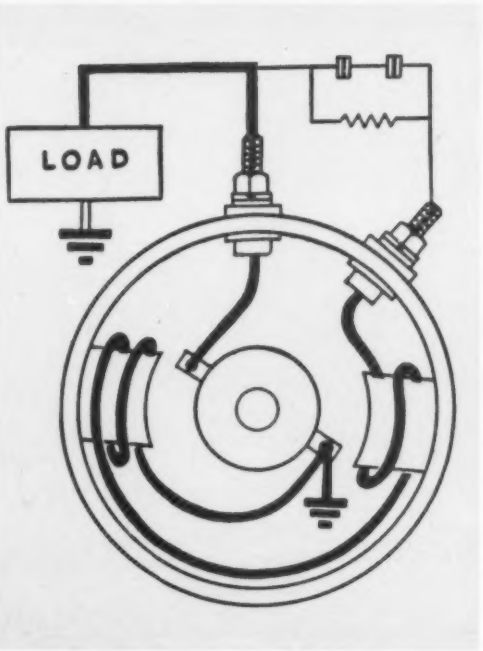
Alternator/Generator System: We all know that our steel steeds function only with the generous assistance of electricity. Where does the electricity initially come from? The battery? Right. OK, how does the battery get recharged? The recharging current has to come



(left)
Exploded view of typical starter. Internal problems may result from loose pole screws and/or overtight thru-bolts.



Wiring diagram of a generator having the field grounded externally through the voltage regulator. Easily identifiable because the grounded brush has only its own lead attached to it.



Generator with internally grounded field. Grounded brush has both its own lead and the field lead connected to it.

BULB
BATTERY
ARMATURE COMMUTATOR BARS
WHEN CHECKING ADJACENT BARS, NO LIGHT WILL INDICATE OPEN CIRCUITED ARMATURE COILS

Generator armature test for open circuit. Same test can be used on starter armatures.

from somewhere . . . so that's why cars (and most other wheeled and/or winged mechanical mules) have electrical generating systems. As we said in the beginning of the article, we won't go into basic electrical theory . . . just take our word for it that a generator generates electricity (in the form of direct current) that is used to recharge the battery and run the various electrical systems in your car. If you want to know more about generator theory and construction, consult a Mitchell's or Motor Manual, or one of the other reference works we mentioned earlier.

In the early days of the automobile there were not too many electrical devices and the generator had (and needed) only a small capacity. As additional electrical equipment was introduced, it was necessary to increase the capacity of the generating system to cover the increased load. While the battery capacity of the 6-volt electrical system has increased only slightly to take care of the increased needs of starting motors and parking lights, the 6-volt generator output has increased from about 15 amperes (amps) to about 50 amps. This is basically the limit of 6-volt automotive generators and was the point at which the 12-volt generator came into use.

Although the 12-volt generator is about the same size externally, it puts out about 25% more electricity and is thus able to carry the entire electrical system load. This is possible because 12-volt generators can use finer wires to carry current and more powerful armature conductors and field coils can be used.

The generator is mounted on the front of the engine and is driven by a belt which may also drive the fan and water pump. It is about four inches in diameter and about nine inches long, and has a small turbine-like fan blade arrangement just behind its drive pulley. Again, the generator generates direct current (DC) for use in battery charging and electrical system operation. The output of the generator is directed to and through a device called the voltage regulator which takes the form of a small metal box mounted on the fender liner or firewall. The voltage regulator has at least three wires running to it and will have terminals marked FLD (field), ARM (armature), BATT (battery), or GEN (generator). It plays a large part in generator troubleshooting procedures, so locate it on your car and be familiar with the terminal names.

If your idiot light for the generator is on, or if your charge/discharge gauge indicates no charge, first make sure all connections on both the generator and regulator are clean and tight. Then, run the engine at fast-idle speed. If the generator still fails to show a charge, go on and read the next paragraph. If a charge is now indicated, you had a poor connection in the circuit. Dirty or loose terminals and connections account for the majority of no-charge conditions concerning generators.

If the generator field is internally grounded (consult your owner's manual or one of the motor manuals) connect a jumper wire from the regulator terminal marked ARM (armature) to the FLD (field) terminal of the generator. If the generator field is externally grounded through the regulator, connect the jumper from the FLD terminal of the generator to the base of the regulator. What you have done is to take the regulator out of the circuit. Again run the engine and if the generator now shows a charge, you can assume the regulator is bad. (Your Motor or Mitchell Manual will have specific info, but generally, the foregoing procedure should *not* be used with double-contact voltage regulators.) With external-ground systems such as the Delco-Remy system, disconnect the generator FLD lead and ground it to the regulator base. With internal ground systems (Autolite, Bosch) disconnect the generator FLD lead and ground it against the ARM terminal of the regulator. If you don't do this little step, you'll probably burn up the lower set of contacts in your double-contact voltage regulator, which will,

continued

as they say, "render the regulator inoperative."

If you still don't have a charge indication, try shorting out the regulator's circuit breaker by running a jumper from the regulator ARM terminal to the regulator BATT terminal. Run the engine again. If you have a charge indication, the regulator is kaput. If you still have a no-charge, it's probably time to trip down to your friendly local generator rebuilder.

Changes AC to DC: The alternator, or AC generator, is really the neatest thing for cars since the pneumatic tire. Today's cars need a huge amount of electricity to run the power antenna and other important systems that are so necessary to the quality of driving today. To supply that power, we would have to use a DC generator about as big as the engine. Rather than use a huge generator, or drive it so fast its tongue hangs out, we use an AC generator to supply the car's thirst for electricity.

Unfortunately, your car can't use AC, or alternating current. So we have to have a way to convert the AC that the alternator provides. To do this, the alternator uses little "valves" called diodes. We call a diode a valve because that is its function. A diode will let DC pass ("valve" open) and not let AC ("valve" closed) get through. The actual function of the diode is to pass *part* of the AC in a steady stream, thereby creating the effect of DC.

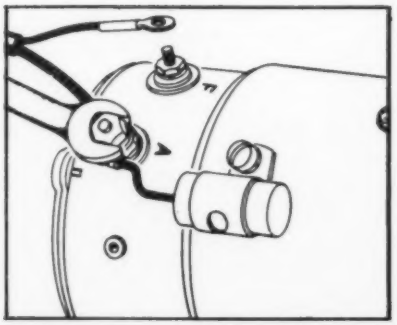
In practice, an alternator uses six diodes, three "negative" diodes linked together in a circuit called a rectifier circuit, or just plain rectifier. This type of circuit arrangement provides a smooth constant flow of DC and the "one-way-valve" action of the diodes prevents current from the battery from discharging back through the alternator.

Newer alternators, called second-generation alternators, incorporate a built-in voltage regulator that is basically unserviceable and unadjustable when compared to the old-style external voltage regulator. This type of alternator is trade-named Delcotron when manufactured by Delco-Remy, and Autolite, Motorola, Leece-Neville, and Chrysler all have similar products.

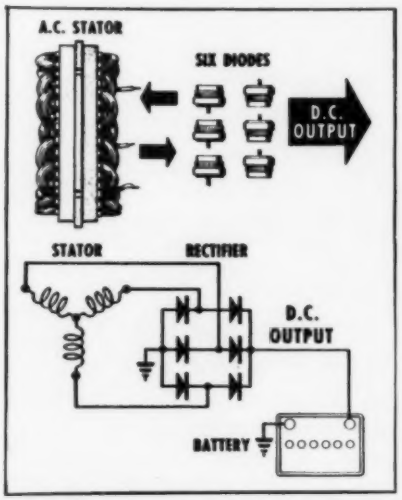
ALTERNATOR SERVICE RULES

- Be certain that the battery polarity of the system is known so that the battery is connected to the proper ground. Reversed battery polarity will damage rectifiers and regulators.
- Booster batteries used for jump starts must be correctly connected to avoid alternator damage. Negative cable from booster battery to negative terminal on vehicle battery, positive cable from booster to positive terminal of vehicle battery.
- When a "fast charge" battery charger is used to charge a battery in an alternator-equipped vehicle, the vehicle battery cables should be disconnected, unless the charger has an "alternator protector" function. In that case, the cables don't need to be removed. Fast chargers should not be used to start an alternator-equipped car as rectifier damage may result.
- Unless the system includes a load relay or field (FLD) relay, grounding the alternator output teminal could damage the alternator and/or circuits. This is true even when the system is not in operation because no circuit breaker is used and the battery power is applied to the alternator output terminal at all times. The FLD or load relay acts as a circuit breaker in that it is controlled by the ignition switch.
- When adjusting the voltage regulator (on cars with adjustable, external voltage regulators) don't short the adjusting tool to the regulator base. The tool should be insulated by taping or installing a plastic sleeve.
- Before making any "on vehicle" tests of an alternator or regulator, the battery should be checked and the circuit inspected for faulty grounding and insulation.
- Check alternator drive belt tension to be sure the belt is tight enough to prevent slipping *while under load*. Correct tension, without the use of a tension gauge, is about ½-inch deflection over a one-foot span of unsupported belt.
- The ignition switch should be off and the battery ground cable disconnected before making any test connections.
- The vehicle battery must be fully charged or a fully-charged battery must be installed before any troubleshooting is done.

Testing of alternators usually requires both a voltmeter and an ammeter, jumper wires, and a thorough knowledge of the location of parts such as the carbon pile rheostat or the generator field control. Delco-Remy, Autolite, Chrysler, Motorola, and Prestolite systems all use different troubleshooting techniques so your best bet would be to gather up your tech data and head on off to the hobby shop.



The condenser is always attached to the "A" or "ARM" terminal of the generator. If connected to the "F" or "FIELD" terminal it would make the voltage regulator go "toes-up" with a resultant overcharge condition in the battery and associated circuitry.

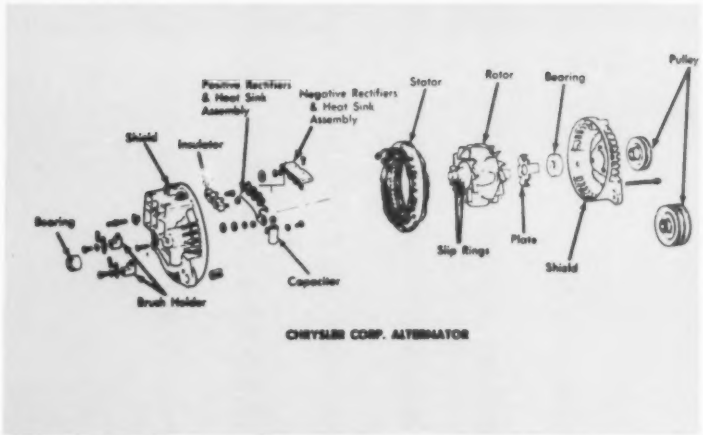


Alternator changes alternating current to direct current by use of diodes.

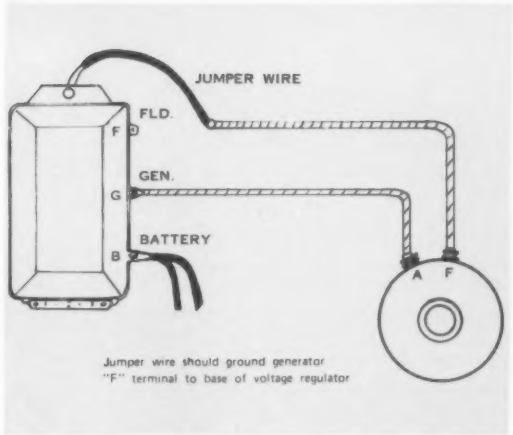
However, in deference to the fact that there are a lot of General Motors cars out there, and the fact that Delco-Remy external regulator systems are fairly easy to troubleshoot, we'll briefly go over the current output test series. Again, for other systems, or for Delco systems with internal regulator, consult your shop manual.

Delco Current Test

- Check and adjust belt tension.
- Disconnect ground cable from battery.
- Connect an accurate test ammeter between alternator terminal marked "BAT" and disconnected ground lead.
- Connect a tachometer from "DIST" terminal of coil to ground.



Exploded view of Chrysler alternator shows location of heat sink screws . . . if these are loose, the diodes may overheat and go out to lunch.



External-ground systems should be jumped like this to take the regulator out of the circuit. Internal-ground systems should have the generator "FLD" lead grounded to the "ARM" terminal of the regulator.

■ Reconnect battery ground cable and connect voltmeter across battery.

■ Apply parking brake, chock wheels, and have your buddy start the engine.

■ Turn on all electrical components and accessories.

■ Adjust engine idle speed to factory specs (about 500 RPM in Drive).

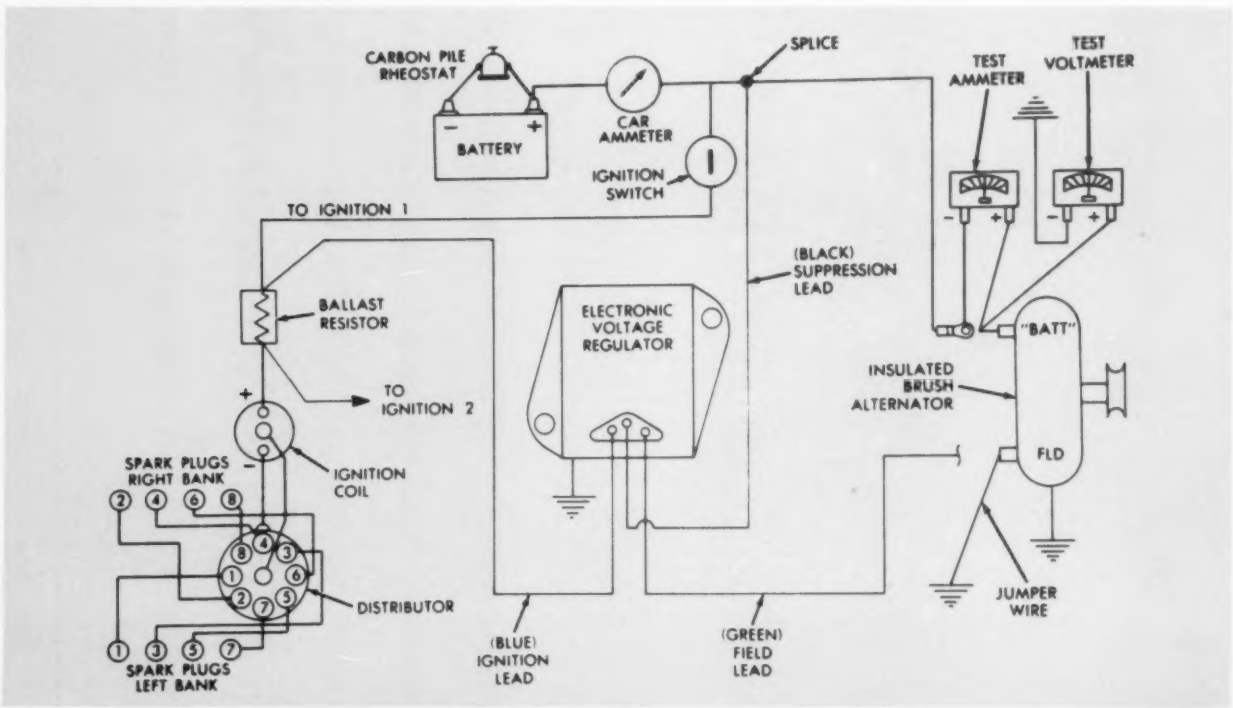
■ At idle, alternator output should be 5 amperes or more.

■ Shift transmission to neutral and increase engine speed to 1500 RPM. Output should be 25 amperes or more.

■ Shut off engine and turn off all accessories.

■ If the output is low in either of these tests, try fooling the alternator into supplying full output. Unplug the "F" or "FLD" connection of the alternator and connect a jumper wire from the "F" terminal to the alternator's "BAT" or "B" terminal. Retest as shown before. If output is still low, the alternator is faulty. If the output is now OK, the trouble lies in the voltage regulator or wiring harness. Clean and check all connections.

■ Remove "F" jumper, and reinstall "F" connector before you forget and move on to next month's chapter about the rest of your electrical system.



Schematic for current output test as mentioned in text.

Timely Topics

AUTO MAKERS URGED TO STANDARDIZE TOWING EQUIPMENT, PROCEDURES

The American Automobile Association and the Society of Automotive Engineers (SAE) both are urging auto manufacturers to make their vehicles easier to tow when disabled.

The nonprofit groups want the locations of towing hookup systems standardized on all new cars and light trucks. Some current American models cannot be towed without risk of damage, they report, and foreign cars are especially subject to damage.

AAA recently announced five changes it would like to see all manufacturers introduce to make cars more towable:

1. Use standard holes in the chassis of all vehicles, both front and rear, to accommodate a standard T-shaped towing hook.
2. Provide towing procedures that are easy to understand and easy to perform by professional tow-truck operators.
3. Design optional equipment, such as front spoilers, so it need not be removed to tow a car.
4. Eliminate the need for special equipment, such as a clevis (a metal, U-shaped shackle), to safely tow a car. Full-sized 1976 and '77 Chrysler products require such a device.
5. Include illustrated towing instructions in the owner's manual of every new car.

Aware that the auto industry historically moves slowly, SAE is campaigning for the adoption of three perhaps more practical measures:

1. That all cars be made towable from either the front or rear.
2. That vehicles be designed to allow towing without having to remove any components.
3. That cars and light trucks be towable at speeds up to 35 mph for 30 miles when resting on their drive wheels.

Meanwhile, to establish a more uniform method for towing the millions of cars which break down annually across the nation, AAA has endorsed a new towing system called a Vulcan Cradle Snatcher. Developed by a Canadian firm, the device lifts a car by its wheels, thereby avoiding contact with the bumpers, body panels, and other easily-damaged parts.

AAA also released a list of foreign-made cars that either cannot be towed by America's sling-lift towing system or have no manufacturer-recommended procedures for towing from the front or from the rear. Most imports are not compatible with American towing equipment because makers provide only for towing the car in its country of origin where a chain or cable may be used. This method is illegal in the U.S. except in bonafide emergencies. *(Editor's Note: Read "Push or Pull?" in DRIVER, Feb. '77, for what to do when your car breaks down.)*

NEW EDITION OF CB RULES NOW AVAILABLE

The Federal Communications Commission (FCC) has announced that the new edition of the Citizens Band (CB) Radio Service Rules is now available from the Government Printing Office for $1.

The Commission said the newly published booklet is Subpart D of Part 95, which contains only the CB regulations. Since Subpart D does not include the rules governing the two other Personal Radio Services, the new edition is shorter and less expensive than previous editions of Part 95.

The Commission also pointed out that the Rules were amended last December to state that CB licensees must have a current copy of Subpart D but they do not need to have the remainder of Part 95.

The new edition includes all the rules a CB licensee is required to keep. Copies can be ordered for $1 from the Superintendent of Documents, U.S. Government Priting Office, Washington, DC 20402. The stock number to use when ordering is 004-000-00342-0.

The FCC reminded CB licensees they are required to keep up with all changes to the Rules in Subpart D. Each amendment can be found in the Federal Register shortly after its adoption. The Federal Register is available in most public libraries. CB licensees can also find rule changes in some CB periodicals.

The Commission said the CB Rules booklet will be revised regularly, but emphasized that licensees must stay current with all changes between printings. Copies of rule amendments are not provided by the Government.

Continuing its program to simplify the CB regulations, the FCC reported that it was making substantial progress toward a "plain English" rewrite of the CB rules. The Commission staff has been working on the redrafting project with members of the Personal Use Radio Advisory Committee to receive reactions from CB users and representatives of the CB industry on the proposed language and format changes. The Commission plans to officially propose a redrafted version of the Rules in the near future.

HELMET FASTENERS

National Highway Traffic Safety Administration (NHTSA) issued a warning to motorcyclists about the safety of 57,000 "Saf-T-Release" helmet fasteners manufactured by F. P., Inc. of Pasadena, California.

The fasteners have been recalled by the manufacturer because a potentially defective coil spring may allow them to open under impact, permitting the helmets to come off.

The warning to motorcyclists was issued because the manufacturer does not have a record of the names and addresses of purchasers to notify individually by mail.

NHTSA opened an investigation in 1975 after receiving an allegation that a cyclist had been killed when his helmet strap—with a Saf-T-Release fastener—failed.

NHTSA testing found that helmets fitted with the Saf-T-Release fastener failed to pass retention tests designed to measure the holding strength of the chin strap. The recalled fasteners were manufactured between 1969 and 1975.

F. P., Inc., will replace at no charge the recalled fasteners with fasteners of a newer design. A cyclist who has a Saf-T-Release fastener should remove the fastener from the helmet and send it, along with name and address, to F. P., Inc., P.O. Box 5295, Pasadena, CA 91107. Cyclists will receive replacement fasteners by return mail.

LETTERS TO BACKFIRE THE EDITOR

PERSONAL FREEDOM

In reference to Mr. C. K. Akins' letter, July '77 DRIVER, here are some facts:

Fact 1: It is illegal to ride a motorcycle without wearing a helmet in almost every state in the United States.

Fact 2: I comply with the law and I wear a helmet when operating or riding a motorcycle regardless of personal opinion and discomfort.

Fact 3: A driver's capabilities are hampered by ingesting alcoholic beverages of any amount.

Conclusion: I shall never understand how you have the gall to enforce the personal discomfort of wearing a helmet on me with the excuse that I would otherwise threaten your pursuit of happiness and at the same time you permit a driver to drink and use the same highway I am traveling.

If thou art so pure in intent as to provide laws that affect, protect, sustain, and preserve the health and well-being of all people and the environment, then look in the right direction and outlaw cars or booze or combinations thereof. And, while you're at it, make it a law that everyone, everywhere wear safety shoes. You just stepped on my foot and I didn't like it.

Norman F. Curtis
P.O. Box 533
Fort Rucker, AL 36362

Actually, several states have repealed their helmet laws, so we are moving backward there. So far as cars and booze are concerned, the combination has been outlawed for some time. But the accident statistics make that hard to believe, don't they?

"WORTH THEIR WEIGHT IN GOLD"

I truly enjoy your articles on motorcycle safety and helmet use. Don't ever let anyone tell you that helmets are not worth their weight in gold.

In April '55, I spilled my bike on a local railroad crossing that had some loose ties not visible from driving level. Evidently they sprang back up as I crossed. There were no witnesses to the accident.

All I could remember was pain when I woke up the following day. Had I been wearing a helmet, my forehead would definitely not bear the scars that I have been explaining to inquisitive people for 20 plus years.

I didn't learn though, because in Oct '55 as I entered an intersection, a car coming from the opposite direction turned into the left-front side of my motorcycle. I went up over the car and suffered a fractured skull. Luckily, neither of us were going very fast. If I had worn a helmet, I'm sure it would have cushioned the impact with the road and prevented fracturing my skull. I had other injuries, but the fractured skull kept me critical for a while.

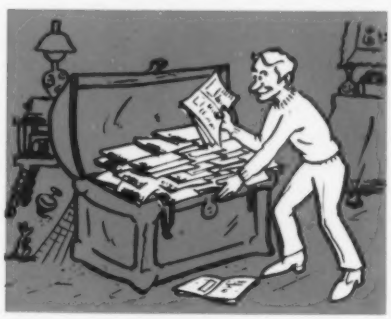
Some people might say I was very foolish to have had two serious accidents so close together. Nothing is further from the truth.

Not all accidents are the motorcyclist's fault. Slow speeds don't always prevent accidents. If I had worn a helmet my face would not be scarred as it is and I know I would not have fractured my skull.

Another thing, if I had used my headlight to alert other cars then I'm sure the other driver would have realized I was riding a motorized vehicle, not a slow-moving bicycle.

I still ride . . . cautiously . . . and I always use my helmet and headlight. I'm sure I won't be faced with the third-time charm situation.

Name Withheld On Request



BACKYARD MECHANIC

I have come across a stack of back issues of DRIVER Magazine, vintage 1974. Your articles are very well put together and excellent in content.

I wonder if you have ever assembled your "Backyard Mechanic" under one cover.

Hope you are still in print. What a loss to us if you are not.

LCDR John N. Milliken, Jr., USN (Ret)
248 Graaf Street
Ridgecrest, CA 93555

Thanks for the kudos. Yes, the "Backyard Mechanic" Volume I has been reprinted twice. It is free to active-duty service people from DRIVER or the Naval Safety Center, Norfolk, Va., while supply lasts. It may be purchased by others for $1.25 from the Consumer Information Center, Pueblo, CO 81009. When Volume II is printed and available an announcement will be made in DRIVER Magazine.

"GETTING IT THERE"

Enjoyed your July '77 issue and the article "Getting It There."

As one who recalls putting his new 18-foot boat into the water to show it off to some fellow Air Guardsmen and forgetting the ignition key, I found Stanley Doering, Jr.'s report on fishing fun to be frankly familiar.

Some other safety tips: Do not use a 1⅞ trailer hitch ball when the trailer tongue requires a 2-inch ball. It can slide around on you. Also, it's a good idea to unplug the trailer lights before backing down into that cold water to avoid losing a couple of lightbulbs. They seem to burn out quickly when emersed. Spare bulbs will keep you in lights while traveling down the highway. I'm told it's also a good idea to annually have the trailer wheels packed in grease—or checked regularly. As a novice boater, I've learned quickly to care for and respect my equipment. I've learned to look before I launch!

DRIVER isn't required reading around this office because I'm usually the last one who gets to read it—we all do. Keep up the good, informative efforts.

Capt Ben D. Kiningham III
183d TFG, ILLANG
Capital Municipal Airport
Springfield, IL 62707

Thanks for the tips!

Address your letters to:
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☆U.S. GOVERNMENT PRINTING OFFICE: 1977—783-013/12

The DRIVERS

An attractive companion and a new sports car are two pretty good ingredients for a nice day . . . until you discover that your brand-new sports car has brand-new oil on the under side of its brand-new hood! Raenell Andrews and J. J. Lawrence remind you that just because a car is new doesn't mean it's OK. Even new cars can develop problems, and a daily inspection is just as important for them as for an older car.

In this case, a service station attendant had neglected to reinstall the oil filter cap and all that needed to be done was replace the cap . . . but how about the possibility of a bad valve cover gasket or a broken external oil line or . . .

Check your new car out just as thoroughly as you would a used one. It can save you time, money, and grief.